CONFORMITY ASSESSMENT REPORT

July, 2002

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Washington, DC
July, 2002

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INTRODUCTION AND SUMMARY

This report (1) identifies and discusses key policy issues in the area conformity assessment of information and communications technology (ICT) equipment, focusing on network and telephone terminal equipment (TTE), including IT and radio equipment; and (2) makes several recommendations concerning the implementation of conformity assessment, which includes the certification of network equipment and TTE.[1] This document satisfies the Task 9 deliverable of the ECICT.

Our major recommendations are as follows:

- ECTEL should accept products and services that meet standards and conformity assessment requirements of the U.S. Federal Communications Commission, Canada, and ETSI.
- To the maximum extent possible, ECTEL should rely on the private sector to satisfy conformity assessment requirements.
- Conformity assessment activities should focus narrowly on electrical safety, electromagnetic coordination (EMC), and radio interference.
- Data collected in the registration process should be limited to the areas that would enable ECTEL to carry out the specific functions listed above.
- ECTEL should monitor emerging high priority, high visibility standards issues such as network security and reliability.
- ECTEL and its members should become parties to mutual recognition agreements (MRAs)) that allow domestic testing and thereby facilitate international trade in equipment and services.
- ECTEL and member states should promote the development of local and regional standards infrastructure, of which conformity assessment is a part.
- ECTEL should take advantage of multilateral assistance programs in this area.

The conformity assessment model adopted by ECTEL should strive for simplicity. ECTEL should look to the private sector to provide expertise in standards development and conformity assessment. Oversight of the largely private standards setting and certification process, rather than direct control and regulation, should constitute ECTEL's principal means of satisfying regulatory obligations and objectives. ECTEL will need to develop the means and institutional relationships that permit it to monitor the most important trends and developments in these areas, even if it does not intend to strictly regulate standards and conformity assessment policies and practices. For the moment,

[1] ICT equipment includes but is not limited to the following: cellular and cordless telephones, fax machines, GSM telephones, mobile radios, modems, wireless remote devices, PABXs (including small business key systems), pagers, radio receivers, satellite earth stations, telecommunications switching systems, telephone instruments, telex equipment, other equipment emitting radio signals, any other customer premises equipment attached to a licensed telecommunications network.

ECTEL members must husband their limited human and technical resources. Standards are critical to modern economies, and accordingly ECTEL should encourage development of a basic standards infrastructure in the region, particularly because its member states envision economic diversification that will depend in part upon sophisticated standards-dependent ICTs.

I. Background

Conformity assessment is the process by which products, services or systems are tested to determine whether they comply with rules and standards.[2] Activities involved in this process include one or more of the following: sample testing, item inspection, process evaluation, management system assessment and registration, and product certification (including declarations of certification); recognition, and accreditation of the competence of testing and certification entities.[3] Any one of these activities involves conformity assessment. Conformity assessment procedures are important to suppliers, manufacturers, customers and regulators. Moreover, an effective and efficient conformity assessment process is of increasing economic significance as ICT products and services increase their share of world trade.

Conformity assessment can verify that a specific product meets a particular level of quality or safety and provides the user with information about the product or service's characteristics, consistency of characteristics, and/or performance. It provides the public, which might include government officials, distributors, and other wholesalers in addition to end users, important information that affects their interests. Conformity assessment also enables suppliers of TTE to distinguish their products from disreputable or unreliable manufacturers. It also enables government regulators to meet their regulatory obligations and goals, particularly those involved in protecting public heath and safety and network reliability.

The conformity assessment procedures of network equipment and TTE traditionally have been based on type approval. Type approval consists of three basic steps:
An applicant supplier submits a formal application for type-approval to the regulatory authority, which then arranges for a test to assess whether or not the equipment satisfies the relevant technical standards.
Regulatory authorities would then review the test results. If satisfied, they would approve the product type tested for sale and use in the country. The approval would remain effective as long as the manufactured product is identical to the tested sample.
To ensure that the final product is identical to the tested sample, some countries incorporate the manufacturer's quality control system as part of the process or require random checks (or both).

The process described above can be expensive and cumbersome and has been subject to criticism as the IT/telecommunications and economic environments have changed from those characterized by dominant monopoly providers to those characterized by liberalization and public sectors committed to economic diversification and investment-led growth. In addition the slowdown in global ICT markets has increased pressures to reduce costs and expedite product and service introduction.

[2] The most widely accepted definitions can be found in Guide 2 (1999) issued by the ISO/IEC.
[3] See International Organization for Standardization (ISO) Guide 2. Also, "ABCs of the U.S. Conformity Assessment System", http://ts.nist.gov/ts/htdocs/210/217/primer.htm

Conformity Assessment in Deregulated and Competitive Markets

Prior to the 1980's, when most telecom carriers were monopolies, conformity assessment was generally mandated by either government or the dominant, incumbent carriers. Testing was lengthy and expensive and was used to prove product safety or a product's capacity to operate under specific conditions or with other certified equipment. Most testing was performed by government-run or government approved laboratories.

The government-centric model is still the norm in some centralized planned economies. But increasingly conformity assessment has evolved into a mix of private and government administered processes. In the EU, conformity assessment is conducted entirely in the private sector. In the U.S., the federal government plays a larger – though shrinking – role in conformity assessment activities although it still has a role with respect to radio transmission equipment and scanning receivers.[4] The US model of conformity assessment consists of several options – verification, declaration of conformity, and certification by the FCC or a telecommunications certification body (TCB) with varying degrees of government involvement. U.S. Government participation in conformity assessment reflects decades of experience, technical expertise, and a plethora of human and financial resources. Even in the U.S., however, there is increasingly reliance on the private sector to address standards-related concerns, which are exceeding the U.S. Government's ability to deal with them in a timely fashion.

The opening up of once government sanctioned monopoly telecommunications markets has led to a decline in the influence of the dominant telecommunications service monopolies over the conformity assessment process. IT innovations, globalization, and the emergence of the Internet have accelerated this process as both the type and number of communications and data handling equipment suppliers seeking certification and conformity testing have dramatically increased. At the same time, the international requirements for testing and certification have become more complex and diverse. This has made for tension between the methodical standards setting and conformity testing of the past and the "speed-to-market" needs of innovation of the present. Governments have increasingly turned to the private sector where the incentives for speed are greatest and to shortcuts such as Mutual Recognition Agreements (MRAs), sometimes also referred to as Arrangements, to help accelerate the conformity assessment process so as not to impede innovation with government regulatory obstacles.

Trade Implications

It has been widely agreed for some time that standards-related issues can be a non-tariff barrier to trade (NTB), beginning as early as the GATT Tokyo Round in the mid-1970's. This position has become a consensus in recent years. As a result, members of the World Trade Organization (WTO) must now commit to apply domestic standards and

[4] See the presentation of William Hurst, Office of Engineering and Technology, Federal Communications Commission at the December 3, 2001, workshop at http://ts.nist.gov/ts/htdocs/210/htaa/ca-wksp/dec-workshop.htm

certification to imports. [5] WTO members are also encouraged to permit equal participation of foreign bodies in conformity assessment activities.

One of the categories most seriously affected by technical standards are ICT products shipped internationally, which in percentage terms have increased even faster than their overall global production. [6] In addition to this growth of trade in ICT products, other global trends that affect conformity assessment and standards include telecom market liberalization, proliferation of technical regulation, shorter product cycles, and need by manufacturers for larger markets against which to spread production costs (scale). As a result, there has been strong pressure from nations that produce telephone terminal equipment (TTE) – i.e., basically ICT products -- to facilitate conformity assessment and open more international markets to TTE products.[7] Ideally their goal would be to harmonize standards and conformity assessment procedures. The lack of harmonized global standards and conformity assessment adds to the cost of goods and services. Suppliers, who may be manufacturers or distributors, are particularly concerned about delays in market introduction and possible inability to enter smaller markets whose standards-related costs may exceed the potential for profit. Delays in market introduction are occurring even as the pace of innovation has been accelerating. Currently the life cycle of the typical IT product has been shortened to between 12 and 18 months, and even a one month delay in introduction in a major market can have significant effects by reducing potential profits.

To mitigate these effects, companies in major advanced economies have developed techniques such as MRAs that enable producers to undergo conformity assessment tests in their home marketsfor certification in the end market. MRAs, negotiated between countries and/or regions, enable testing and certification to be expedited and undertaken more cheaply than testing and certification after shipment. Although suppliers must still meet local standards, MRAs help reduce logistical problems and unnecessary, duplicative costs, even if they are a temporary measure that falls short of harmonization.

For the most part international trade concerns currently are a minor concern to ECTEL members as they produce few, if any, TTE/ICT goods and services that must undergo conformity assessment procedures. However, it is conceivable that they may have a future interest in conformity assessment if their economic diversification plans into ICT succeed. In such an event, they will want access to developed North American, European, and Asian markets. Their more immediate concern should be to promote efficient local IT and telecommunications markets to improve the overall economic welfare of member states and to make their economies as competitive as possible. This can be done best if imported ICT equipment and services have minimal burdens on

[5] WTO Agreement on Technical Barriers to Trade (TBT).

[6] The share of ICT equipment in world merchandise exports increased from 9 percent in 1990 to 13 percent in 1998. Patrick Low, "International Trade in Information Products," WTO Information Technology Symposium, 16 July 1999, Geneva.

[7] See the Telecommunications Industry of America (TIA) Web site at http://www.tia.org . Membership in the TIA includes North American, European and Asian manufacturers.

market access and use, so that wholesale and retail customers have access to the best, most productive equipment and services available if they need them.

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II. Regulatory Environment

Goals of Regulation

Telecommunications service over the public switched telecommunications network (PSTN) is provided by interconnected carriers. The industry as a whole has evolved a comprehensive process for ensuring interoperability. Telecommunications authorities, therefore, do not need to act as if the requirements of ensuring interoperability represent a brand new issue in need of a brand new response on the part of government.

In the past, for ECTEL members, Cable and Wireless as the monopoly public switched network service provider ensured network integrity and reliability, set the standards and procedures for certifying network and TTE interoperability compliance, and achieved conformity assessment through type approval. Today with the entrance of new carriers and equipment providers into the market, the complexity of ensuring against non-compliance and resulting harm to the network and customers has increased. To begin with, liberalization means that telephone service involves more players. Moreover, as technology has advanced, ensuring network stability and reliability through conformity assessment has come to include many more levels of technology integration at many hardware and software interfaces.

The accelerating pace of technological change and innovation in the networking markets has put a premium on timely and efficient conformity assessment processes. The historically slow, methodical testing and assessment programs of the incumbent monopolies and governments have become increasingly inadequate to the needs of the rapidly changing telecommunications sector.

Member governments need not and should not seek to address conformity assessment and its growing complexity by assuming responsibility for establishing themselves as a new engineering and design entity for constituent telecommunications service and equipment providers. Neither ECTEL nor the NTRCs need to do this. Nor do they possess the resources or expertise to do this effectively and efficiently. Even in the advanced technology-rich economies, "outsourcing" much of the compliance testing and certification work to specialized private sector standards bodies and/or the private sector testing organizations has become the preferred solution. This trend towards greater reliance on private sector initiatives holds true even in the U.S., where government and private entities share standards responsibilities and where U.S. Government agencies enforce multiple regulatory objectives.8 Overall the results of reliance on the private sector have been quite satisfactory and the lessons learned easily

[8] "Guidance on Federal Conformity Assessment Activities," NIST, 10 August 2000, p. 6.

transferable. ECTEL and the NTRCs should follow a similar course and should benefit similarly.

The Model Telecommunications Act and the Roles of ECTEL and NTRCs

This project specifies that telecommunications network equipment and CPE interconnection conformity assessment and certification is sought on a regional basis. ECTEL indeed is the logical locus of authority to guide and oversee the development of such "outsourced" standards activities. The various national telecom reform laws locate authority to grant type approval and certification in the NTRCs, but also permit the commissions to turn to ECTEL for advice and recommendations on matters related to recognition of type approval and the underlying technical regulation. The NTRCs can meet their legal obligations and responsibilities for certification under the new laws (accepting type approval applications, fees, granting certification) even as they depend on ECTEL to do the heavy lifting of establishing and managing the "outsourcing" and working relationships with private institutions and industry associations to determine whether the proper conformity assessment procedures were followed.

In the new national telecommunications laws and implementing regulations, most conformity assessment activities are delegated to the private sector and reliance is placed on the activities of competent, experienced foreign bodies. For example, network operators are responsible for ensuring that the CPE and other data and telecommunications products they or their affiliates supply to their customers conform to appropriate (international) type approval and interoperability testing requirements. Similarly, private sector network operators are responsible for certifying that proper installation standards and procedures are followed with respect to the installation of all CPE attached to their respective networks. Regulators have a strictly limited but important role to play in these areas. Most importantly, ECTEL and NTRC regulators need a market surveillance system so that they identify cases of fraud, counterfeit, consumer safety threats, network harm or disruption, interference, and other problems that might have standards or conformity assessment origins. Organized into a usable database, this basic information will enable government and the general public to move against parties who do not comply with conformity assessment procedures, distribute counterfeit or dangerous hardware, misuse certification marks or otherwise violate national laws and regulations.

Another area for regulatory attention might arise if the dominant network operator were a horizontally integrated supplier-carrier. A monopoly or dominant carrier is in a position to manipulate technical standards, accreditation, testing and certification to favor affiliated or preferred equipment and service suppliers to the detriment of superior competitors. A fully competitive telecommunications market would be the best deterrent to this prospect.

ECTEL Conformity Assessment Efforts

Telecom network and customer premises equipment manufacturing is a business where profitability almost always depends on the achievement of scale production runs. Therefore, manufacturers are not inclined to produce, supply or re-design equipment for niche or small markets. This means that, to the maximum extent, government sanctioned interoperability standards have conformed to a base of general, widely accepted industry standards.

Government sanctioned base standards have, by and large, focused on network harms (radio interference and EMC) and electrical/consumer safety. Some national regulatory bodies also may look at service quality and network reliability as part of their standards regulation, but in the main they focus on these three areas. In this instance, interoperability does not equate to seamless, integrated operations that cover optional or proprietary equipment features. By limiting the conformity assessment requirements to these three base areas of concern, regulators can help ensure the widest possible choice of certifiable telecom equipment for customers. Limited, focused regulatory goals remove some of the disincentives and barriers to innovation and encourage the private sector to voluntarily develop and use bilateral agreements for establishing the procedures needed for more advanced and comprehensive testing and certification as needed. In other words, where private enterprise has determined that there is value in achieving higher than base-level interoperation of network services or interconnected equipment, the interested parties have devoted the resources and effort to make it happen.

Only where voluntary industry action has failed to produce the desired results or where there are other market failures such as vendor fraud and deception would regulatory intervention in the form of mandated and monitored conformity assessment activities be required.

Regulatory Challenges

While direct government regulation should be limited and focused on a few areas, there are high-priority emerging challenges that warrant attention and are, in fact, receiving such consideration from national regulators, multilateral organizations, academic and industry experts, and private and public sector standards groups. These include network reliability and, more recently, network security. In view of these matters' import to the modern economy, fast moving nature of the overall threat to the IT sector and other critical infrastructures, lack of standards and global agreement on harmonization, relative novelty of network security issues, diversity of fora and venues globally, and immediacy of the problem, public officials need to be more knowledgeable and involved than normal. Their significance should still not detract from the general principle of private sector leadership on standards issues.

The leading organizations in this specialized area are in North America and European Union.[9] Recently the Center for Internet Security [(CIS) at http://www.cisecurity.org] released a benchmark, which has been incorrectly described as a standard by the mass media, but which is in fact a set of measurements, protocols, and best practices. This benchmark measure is based on joint industry-public efforts by a consortium of organizations and government agencies. Performance benchmarking may become a model in this particular technical area, which is characterized by unique national and international traits.

Network security further deserves attention because some ECTEL member governments operate internal data networks and/or are large shareholders in incumbent national carriers such as but not limited to the ILECs operated by Cable & Wireless or cable systems.

Private Sector Compliance Testing of Network Equipment and CPE

There exists in the U.S and in other advanced economies a highly regarded equipment interoperability compliance-testing infrastructure for network equipment. All network equipment suppliers use one or more or these laboratories to certify compliance of their equipment to specific government and network provider interoperability standards. This report provides a partial list of U.S. organizations and contacts in Appendix C.

A similarly robust and widely accepted infrastructure for CPE testing and certification does not currently exist although, since 1999, several regulatory bodies in the advanced economies of the North America, Asia-Pacific, and Europe have sought to encourage such a development. In the absence of a similar infrastructure of CPE-testing labs and of harmonized global conformity assessment procedures, manufacturers have relied on a process of self-certification based on the essential inter-operational technical requirements and specifications for network-to-CPE interconnection disclosed by network providers. The institutions that have a leading position in this technical public policy area are located in North America and Europe.

Cable & Wireless currently lists the technical interface standards for network equipment and CPE interconnection to its network at its website (http://www.cw.com/th_05.asp?ID=pp_interface_docs). While most of this CPE testing and self-certification activity takes place within the private sector, government can help expedite the process by endorsing an industry provided “check list” of technical issues that must be considered and addressed by private parties when working out specific bilateral network-to-CPE interconnection certification arrangements. These checklists of issues take the form of templates. Samples are included in Appendix B. Briefly they are as follows:

[9] These entities include the Center for Internet Security (http://www.cisecurity.org), ETSI, NIST, General Services Administration (GSA at http://www.gsa.gov).

- Network Interconnection Bilateral (or intercorporate) Agreement Template: list of issues governing joint planning sessions between interconnecting service providers.

- Network Interface Specification Template: a list of the minimum issues service providers must address to establish and maintain points of interconnection. This includes operational issues such as power and grounding requirements, radio and electrical interference protection requirements, synchronization and timing requirements, etc.

- New Technology Reliability Template: a list of issues both service providers and equipment suppliers need to address when new technology is being introduced into existing networks.

Limits of Industry-wide Interoperability Standards

Standards alone cannot ensure interoperability or provide the assurance required by markets and purchasers. Many of today's voluntary standards are framed so broadly as to leave room for interpretation. Bilateral agreements and interoperability testing between private network providers and equipment suppliers are frequently necessary components to ensure interoperability. As noted in an introductory paper,

> "Conformity assessment activities form a vital link between standards (which definite necessary requirements for products) and the products themselves. . . . Conformity assessment can verify that a particular product meets a given level of quality or safety, and provide the user with explicit or implicit information about its characteristics, the consistency of those characteristics, and/or performance of the product."[10]

This also suggests a limit on suppliers' declarations of conformity. Type approval, which must encompass the full scope of multiple conformity assessment procedures, is still essential at some point in the production, sale or distribution processes to ensure that the purchaser receives sufficient information about the product, service or system. The vital point is that the procedures required by conformity assessment should be performed in the simplest, most cost-effective manner without compromising the basic integrity of the processes.

Effective Voluntary Conformity Assessment Process

As alluded to earlier, there are many good reasons for both developing and advanced economies to take advantage of existing voluntary industry standards development and conformity assessment processes rather than trying to establish their

[10] "The ABCs of the U.S. Conformity Assessment System", NIST, April 1997, p. 3. http://ts.nist.gov/ts/htdocs/210/217/primer.htm

own system. However, this does not mean that government and regulatory authorities should adopt a completely "hands-off" approach in this area. In fact, where the policy of leaving it up to the industry to develop a voluntary approach to standard setting and certification has been most successfully applied, government regulators played an early and active role in jump-starting the process.

For example, in the United States, federal regulators recruited technical experts from the telecommunications industry to develop the series of templates referred to earlier that were used to identify the key base interconnection, safety/reliability, network interface and new market or product introduction issues that interconnecting equipment suppliers and network providers need to address and agree on before actual interconnection took place. A sample of these templates is included in Appendix B.

Government also had a role in ensuring that the incumbent service provider cooperated in disclosing the base technical information needed by other interconnecting service providers and network equipment and CPE suppliers seeking conformity certification. Because of concerns that such disclosure requirements avoid turning over "proprietary" technical information that service providers or equipment suppliers depend on for competitive service or product differentiation, government regulators have generally required the disclosure of only the minimal or basic technical requirements for interconnection and interoperability. That is, participants disclosed the technical information needed to avoid network harms and interference and ensure consumer safety upon interconnection. Participants were not required to disclose the technical requirements for the higher standard of "seamless" integration and interoperation.

III. Recommendations

- Recommendation 1. ECTEL should accept the products and services that meet the standards and conformity assessment requirements of the U.S. FCC and Telecommunications Standards Advisory Council of Canada (TSACC) and, in the area of mobile GSM products and services, the European Telecommunications Standards Institute (ETSI).

  Discussion. Acceptance of existing and future TTE standards and conformity assessment procedures, i.e., the type approved information and communications technologies, would yield several immediate as well as long-term advantages. It would save time by leveraging work already performed or approved by the leading North American entities overseeing wired TTE and by ETSI, the leading wireless GSM standards organization; conserve resources by avoiding duplicative or unnecessary work; expedite the introduction of equipment and services; and focus ECTEL's efforts on a limited number of regulatory goals that are recognized as legitimate areas of regulatory oversight. In the highly unlikely event of a disagreement between the U.S. and Canadian standards and conformity assessment bodies, the conformity assessment procedures providing for the highest degree of safety should prevail. If safety is not the issue, then the U.S. standard should prevail as it is the largest and most significant national market.

- Recommendation 2. ECTEL should rely on private sector to the maximum extent feasible to satisfy conformity assessment requirements. In particular, it should accept suppliers' declarations of conformity (SDOCs) with proper documentation unless it has good reason not to do so.

  Discussion. SDOCs are a move towards deregulation of TTE and are increasingly common as this procedure is faster than testing conducted by regulatory authorities. In practice, this recommendation, together with recommendations 1 and 3. would mean that most TTE/ICT items should be able to be shipped to ECTEL member countries without undergoing conformity assessment procedures specific to ECTEL. They would make the ECTEL area comparable in its openness to the US-Canada market.

  As noted above, there have been instances of counterfeit, non-conforming equipment entering markets because unscrupulous vendors appropriated a legitimate certification mark, provided an SDOC and then moved out of the jurisdiction or closed down a business to avoid liability. These problems are addressed in the U.S., Canada, EU, Australia and other advanced economies by market surveillance to detect fraud plus the application of tort liability or consumer protection laws to vendors and their successors. Sales of counterfeit goods or misuse of a regional

certification mark can be difficult to weed out prior to equipment failure even with sophisticated and resource-intensive conformity assessment procedures. It also occurs in advanced economies. ECTEL should ensure that there are the necessary criminal fraud, consumer protection, and tort liability laws in place to prosecute fraud cases.

- Recommendation 3. The focus of conformity assessment activity should be on electrical safety, electromagnetic coordination (EMC), and radio interference.

  Discussion. While regulatory entities worldwide have different goals and agendas, increasingly in developed economies, standards regulation focuses on these three areas that are seen as appropriate for global harmonization activities.[11] Radio interference has been specifically designated as an area for standards regulation by the ECTEL model legislation and in the new national telecommunications laws.[12] Electrical safety falls within the work jurisdiction of the ISO-International Electrotechnical Commission (IEC). Products that meet ISO/IEC standards and conformity assessment pursuant to U.S. and Canadian requirements will satisfy global standards and should not be an individual concern of ECTEL. This recommendation is fully consistent with Recommendations 1 and 2 as it will focus ECTEL's efforts to limited areas.

- Recommendation 4. Data collected pursuant to registration requirements should be clearly organized to assist ECTEL's functions such as market surveillance to obtain the maximum benefits of its activities in the standards area.

  Discussion. The information collected under the standards and conformity assessment procedures should be correlated to the activities in which ECTEL is involved, which should be market surveillance of safety problems, fraud, etc. rather than for general data bases or for standards development and conformity assessment activities that are better performed by the private sector. This recommendation is intended to minimize the reporting burden on private parties and simplify regulatory tasks.

- Recommendation 5. ECTEL should be aware of, and follow, certain high-priority emerging standards-related issues, most notably network security, while continuing to rely on the private sector's and other public sector entities' technical expertise.

[11] See Organization for Economic Co-operation and Development, "Standards-Related Barriers and Trade Liberalization: Telecommunications Sector", (7 March 2002), pp. 4, 24-25.

[12] Part VI Section 60 of the ECTEL model legislation prohibits the operation of equipment that causes radio interference with other parts of the network.

Discussion. There will be some emerging issues that present either a technical or policy challenge to both the private and public sectors. The most important of them at this time is network security, which has become a high priority for governments and the private sector. Considerable attention is being dedicated to network security and safety in virtually all technical and policy fora because of the subject's obvious significance to the information infrastructure, but there has little consensus on how to develop standards, procedures, and protocols to deal with the proliferating number of viruses, crime, hacker attacks and/or terrorist threats.[13]

- Recommendation 6. ECTEL should become a party to regional MRAs with reliable standards and conformity assessment procedures, specifically North America, EU, and APEC.

  Discussion. For the most part, this recommendation will not affect ECTEL or its members as the first three recommendations will result in an open market for TTE/ICT equipment. Rather this recommendation looks towards the longer-term future when the ECTEL economies have successfully diversified and export ICT products and services that could become subject to foreign regulation. MRAs would facilitate their access to foreign markets assuming that there are accredited regional testing and accreditation facilities.

- Recommendation 7. ECTEL should explore means to leverage its activities to promote standards development and conformity assessment activities within the region, thereby strengthening the local standards infrastructure.

  Discussion. Standards and related activities are an essential, pervasive component of modern, advanced ICT economies. Accordingly it is crucial that Caribbean countries develop both the cultural and economic understanding of their importance and the ability to deal with standards-related issues, especially in relationship to productive industrial activities. Efforts need to be made to collect, transfer, and disseminate standards knowledge to rapidly developing economies such as ECTEL member states. Accordingly, it is recommended that whenever opportunities to increase local capabilities arise, whether in the context of staff training, personnel exchanges, foreign academic programs, programs from accredited American or European entities, etc. ECTEL should exploit such opportunities where and whenever feasible.

[13] There are a number of papers and studies on this subject, of which the latest is "Network and Information Security: Proposal for a European Policy Approach", Communication from the Commission to the council, the European Parliament, thhe European Economic and Social Committee and the Committee of the Regions (May 2002).

- Recommendation 8. ECTEL should take advantage of multilateral agencies' assistance programs to develop a standards infrastructure in the TTE sector, specifically programs organized by the International Organization for Standardization (ISO) and International Telecommunications Union (ITU) at a minimum.

  Discussion. For reasons noted above, multilateral agencies' assistance programs could help strengthen the overall capacity of ECTEL and the regional private sector to deal with conformity assessment – and general standards-related – activities in the long run. ECTEL and its members would benefit from acquiring such knowledge apart from its immediate relevance and could gain significantly at little or no cost to ECTEL. Similarly these entities should be encouraged to digitize more of their materials and archives and to make more information available online.

Appendix A – Selected References

There is a substantial body of material on conformity assessment and other standards-related issues. Much of it is technical and intended for experts or, at a minimum, well-informed industry stakeholders. Several of the most important documents are listed below. Additional information about conformity assessment can be obtained online at these Websites, from which additional documents can also be downloaded. Both printed documents and Websites were consulted in the preparation of this report.

"The ICT Industry Green Paper on a Global Product Conformity Assessment System for the Future", (including an ECTEL proposal) International Telecommunications Union, August 15-16, 2000. http://www.itu.int

"ISO Development Manual 2 Conformity Assessment," 2nd Edition, International Organization for Standardization, France, 1998.

"ISO/IEC Guides Compendium Conformity Assessment, 4th Edition, International Organization for Standardization/International Electrotechnical Commission, Switzerland, March 1999.

"The ABC's of the U.S. Conformity Assessment System," U.S. Department of Commerce, Technology Administration, National Institute of Standards and Technology (NIST), April 1997. http://tr.nist.gov/ca

"Standards-Related Barriers and Trade Liberalization: Telecommunications Sector', Working Party of the Trade Committee, OECD, 7 March 2002. http://www.OECD.org

"Guidance on Federal Conformity Assessment Activities", U.S. Department of Commerce, Technology Administration, National Institute of Standards and Technology (NIST), 10 August 2000, http://ts.nist.gov/ts/htdocs/210/gsig/caguidance.htm

"A Guide to EU Standards and Conformity Assessment", NIST Special Publication 951. U.S. Department of Commerce, Technology Administration, National Institute of Standards and Technology (NIST), May 2000. http://ts.nist.gov/ts/htdocs/210/gsis/eu-guides/sp951.htm

"ISO in the 21st Century: Strategies for 2002 – 2004", International Organization for Standardization, France, 2001.

http://ts.nist.gov/ca A compendium of information sources entitled "Conformity Assessment Information" as well as a portal to hyperlinked Websites that contain information about the conformity assessment generally, U.S. activities focusing on but not limited to NIST, accredited bodies, ISO and IEC, non-U.S. activities, and free reports.

http://www.fcc.gov/oet The Office of Engineering and Technology (OET) is responsible for technical activities within the Federal Communications Commission. Conformity assessment and other standards-related Information and links can be found at the Commission's Website.

http://www.tiaonline.org/standards/star/tr41.c.cfm Committee TR-41 addresses voluntary standards for telecommunications equipment and systems, and networks, specifically those used for voice services, integrated voice and data services, and Internet Protocol (IP) applications. The Telecommunications Industry Association (TIA at http://www.tiaonnline.org) is a leading U.S. standards entity focused on telecommunications equipment and is affiliated with the Electronic Industries Association (http://www.eia.org).

http://www.is.org/iso/en/aboutiso/introduction. The International Organization for Standardization (ISO) was established to agree on world standards to help rationalize the international trading process and harmonize standards for similar technologies in different countries. ISO is made up of national standards institutes from countries large and small in all regions of the world. ISO develops voluntary technical standards to increase levels of quality, safety, efficiency, compatibility, and interchangeability and provide these benefits at economical cost. This work is carried out by experts on loan from the industrial, business and technical sectors that have asked for the standards and from government agencies, educational and research establishments and testing laboratories.

http://www.tsacc.ca/e/organization The Telecommunications Standards Advisory Council of Canada is an industry-government cooperative council formed in 1991 to develop a strategic focus of the development and implementation of Canadian information technology and telecommunications standards.

http://www.scc.ca/infocentre Standards Council of Canada. Portal with hyperlinks to Canadian, foreign national, and international (regional and multilateral) Websites.

http://www.ansi.org The American National Standards Institute works with more than 175 accredited entities to promote and facilitate voluntary consensus standards and conformity assessment systems and is the U.S. representative to ISO.

www.bsi-global.com/Testing+Certification/Products/telephones Information about UK, EU, and Australian testing and certification programs.

Appendix B – Templates and Check-off Lists

This Appendix is intended to present a variety of templates, or check-off lists, that can be utilized to identify actions and activities to undertake in order to ensure proper interconnection. These templates were developed for use by U.S. stakeholders and can be found at the FCC's Website. These examples are not intended to suggest that they should be the basis of ECTEL's conformity assessment work program and are for reference only.

Network Interconnection Template applicable to interconnection between networks

INTERFACE SPECIFICATION CRITERIA	CHECK OFF
[Define the physical/software interfaces in terms of existing tariffs and technical standards and government regulation.]	
Establish a clear point of demarcation that allows for non-intrusive test access.	
[Define the environmental operating requirements according to security and reliability needs.]	
[Develop power and grounding requirements in accordance with safety and protection regulations, codes and standards.] When applicable, develop power and grounding standards in accordance with safety and protection regulations and codes.	
Define network diversity requirements and survivability capabilities needed.	
Define interference generation protection levels relative to radiated and conductive electromagnetic properties.	
(Radio interfaces only) Define frequency channelization, bandwidth, power level, frequencies, tolerances and adjacent channel interference levels.	
Clearly identify protocol elements (e.g., in terms of the seven layer model OSI protocol stack).	
Define all message sets that will be transmitted across the interface.	
Develop gateway screening functional requirements to block accidental or unauthorized intrusion of unwanted/inappropriate messages.	

Build for robustness by defining error correction, re-transmission overload controls and fault migration mitigation criteria.	
Develop message sets to facilitate fault detection, identification, diagnosis and correction.	
Develop network interface performance design objectives in terms of signal transport time (*e.g.,* delay), availability (*e.g.,* downtime), lost message probability and transmission criteria (*e.g.,* bit and block error rates, cell loss ratio, packet loss, noise, phase jitter)	
Define synchronization and timing requirements and establish monitoring and back-up capabilities.	
Ensure that forward and backward compatibility of the protocol is addressed for transition management.	
Provide local and remote network management notification and control capabilities.	
Develop a network impact statement to predict/specify the backward compatibility and purpose of the standard.	
Develop demonstrable performance criteria at agreed stages of specification development.	
[Define and conduct acceptance testing to validate the defined stages of specification development.]	

Brackets [] indicate items that may not be applicable to SDs.

Network-to-CPE Interconnection Specification Template

Interface Specification Criteria	Check off
Service Demarcation : Establish a clear physical demarcation point between the network provider and the user that allows for signal loopback that isolates problems to either the network provider or the user side of an interconnection.	
Operating Environment: Define the physical operating requirements (temperature, humidity, premises access, *etc.*) to maintain equipment security and reliability in order to minimize interconnection disruption due to changing environmental conditions.	
Power and Grounding: Develop requirements that protect equipment from damaging power surges and anomalies, such as lightning, and that also ensure user safety.	
Network Survivability: Define level of service survivability in terms of network route diversity and equipment redundancy in accordance with the criticality of the interconnection.	
Interference Tolerances: Define protection levels relative to radiated and conductive electromagnetic properties of equipment and facilities in order to mitigate signal interference.	
RF Transmission Specifications: Define frequencies, channelization, bandwidth, power level tolerances, adjacent channel interference levels, *etc.*, for interconnections using RF media, such as over the airwaves or via coaxial cable.	
Transmission Specifications: Define network interface performance objectives in terms of signal transport time (delay), availability (downtime), lost message probability, transmission criteria (signal levels, signal thresholds, BER, loss, noise, phase jitter), *etc.*.	
Protocols: Define data communications protocols and level of conformance to the seven layer model OSI protocol stack to ensure interoperability between network provider and user devices.	

Message Set: Define data communications message set that will be transmitted across the network provider/user interface to ensure interoperability.	
Network Security: Develop gateway screening functional requirements to block accidental or intentional intrusion of unwanted/inappropriate messages/commands.	
Fault Mitigation: Define error correction techniques, re-transmission overload controls, and other mitigation criteria that prevent fault migration through the network.	
System Diagnostics: Define requirements for fault detection, identification, and correction in the network to expedite maintenance procedures.	
Network Synchronization: Define synchronization and timing requirements, including source and stratum level of timing and availability of back-up timing to minimize accumulated jitter and wander and the occurrence of timing slips that cause the loss of user data.	
Transition Management: Ensure forward and backward compatibility of upgrades to equipment, including protocols and other features/functions, to minimize service disruption and cost impacts to users.	
Network Management: Define local and remote network management capabilities, including monitoring, provisioning, and level of access and control of the interconnection by the user.	
Performance Monitoring: Define the performance parameters that will be tracked by the Network Management system to provide proactive maintenance of the interconnection.	
Testing: Define both intrusive and non-intrusive test capabilities and identify the test access points for the purposes of fault isolation.	

INTERNET INTERCONNECTION SPECIFICATION TEMPLATE

A crucial step in eliminating barriers to Internet interoperability is to establish a document that clearly and precisely defines the technical criteria and standards to be met by network providers and ISPs when providing a network to user interconnection. A requirements template has been developed that serves as a guideline for Internet interconnection. This template categorizes and briefly describes the technical specifications necessary to connect networks to ISPs. This template includes a checklist of technical areas-of-concern that must be addressed for each type of Internet interconnection to ensure interoperability. Addressing each technical category in the template by identifying specific interconnection specifications will ensure that a baseline level of interoperability will be achieved. This template may further serve as the basis for development of a test suite for verifying interoperability.

The template should be used by the network provider and the ISP to furnish as much relevant and detailed information as possible so that they may both deploy the appropriate equipment and services needed to meet interconnection requirements in a timely manner.

Interface Specification Criteria	Check off
Service Procurement Criteria	
Define Reasonable Planning Cycle Identify planning cycle that meets the needs of the ISP to forecast growth and the needs of the network provider to forecast service changes.	
ISP Usage Requirements Define expected usage by ISP location for the planning cycle (total number of minutes per month, number of minutes in the busy hour, identification of the busy hour, number of lines needed by type of service, *etc.*).	
PSTN Retail Service Availability Define retail services available (1MB Service, ISDN PRI Service, AIN features, Modem/PAD services., *etc.*) by Central Office for the planning cycle.	
PSTN Wholesale Service Availability Define wholesale services available, including bundled and unbundled wholesale services, for the planning cycle.	
Procurement and Identification of Network Services for ISPs Define standard procedures to order facilities that can be automated by both ISPs and network providers and that can be reconciled by both ISPs and network providers.	
Maintenance and Operations Criteria	
Fault Isolation Define procedures to insure that faults can be identified and corrected as quickly as possible and that communications of the process is shared between the network provider and the ISP.	

Operations Standards Implement procedures to share operational information related to performance of ISP lines	
Performance Measurements Implement ongoing performance measurements for offices that contain ISP lines that provide information on call blocking, dial tone blocking and implement ongoing performance measurements for ISP lines that identify percent redials.	
Performance Standards Create standards for ISP lines regarding percent redials and for offices that contain ISP lines for call blocking and dial tone blocking.	
Planning and Information Sharing	
Define Planning Cycle Identify planning cycle for information sharing that provides a long enough time frame to work out industry problems and provides information that can be forecast reasonably accurately.	
PSTN Changes to Local Dialing Areas Share proposed changes to calling area numbering and placement of equipment.	
ISP Long Term Growth Projections Provide information on seasonal growth patterns and expected service changes that may impact growth.	
PSTN New Service Deployment Plans Provide information on proposed new retail and wholesale services, including proposed tariff changes, deployment plans and protocol impacts.	

Network Interconnection Bilateral Agreement Template

1.0 Requirements and Agreements for Provisioning Network Interconnection
General Reference: NOF Reference Document Sections 1,2,4, and 9
* - Tariff Identification
- List of Services
- Unbundled Elements
- Explicit Forecasting Information
- Direct Traffic
- Subtending/Transition Traffic
- Documentation Requirements
- Service Level Agreements
- Interface Specification
- Service Provisioning Process
- Specific Versions of Protocol and/or Interface Specifications
- Network Interface Standards, Version Control (Backward Compatibility), Mandatory and Optional Categorizations
* - Interface for Ordering/Pre-Ordering
- Network Synchronization Planning/Design
- Compatibility with Year 2000 Specifications
- Specific References: GR 2945, ISO 8601
- Ensure Compatible Date Formats on Interface
- Compatibility of Expanded Use of Information Digits
- Network Design Parameters
- Network Administration/Operations Security Requirements
- Specific References: T1 252, 233, 243, GR 0815, GR 1322
- Access Methodology Requirements
- Firewall Requirements
* - OSS Interface Requirements
* - Applicable Tariffs on Confidential Information
- Data Connection Security Agreements
- Authentication and Access Control
* - Electronic Bonding Requirements
- Message Sets Exchanged
- Performance Parameters (Throughput, Availability, *etc.*)
- Audit Requirements

Network Interconnection Bilateral Agreement Template (continued)

- Service Interworking Requirements
- Re-Sale Related Services Requirements
* - Operator Services/DA Routing and Branding
- Unbundling Related Services Requirements
* - Dialing Plan Requirements
* - Network Element Requirements
- Diversity Requirements
- Route Identifications
- Diversity Definition
*- Special Routing Translations (SSP, STP)
- Protocol Implementation Agreements
- Specific References: TR 246, T1.114, T1.116, GR 317, GR 394
- Timer Values
- Route Set Congestion Messages
- Optional Parameters
- Switch Parameters
- MDF Requirements
2.0 Installation and Maintenance Guidelines, Procedures, and Responsibilities
General Reference: NOF Reference Document Sections 1, 2,3, 4, 6, 7, 8, and 9
- Guidelines for Meeting/Maintaining Performance Service Levels
- Interface Specifications
- MTBF/MTTR
- Performance Thresholds (Tolerance Range)
* - E911 Database Updates
- Measures For Specific Service Classes
- Monitoring and Reporting Mechanisms
- Responsibility Assignments
- Facility Assignment
- Network Control
- Documentation Requirements
- Contact Numbers
- Implementation Plans and Associated Milestones

Network Interconnection Bilateral Agreement Template (continued)

- Maintenance Procedures for Status and Trouble Reporting
- Inter-Network Trouble Resolution and Escalation Procedures
* - Contact Lists
- Internetwork Contacts
- Security Contacts
- Emergency Communications Plan
- Regional Emergency Preparedness and Response Program
- Equipment Supplier Participation
- Security Management Participation
- Mutual Aid Agreements
- National Security/Emergency Preparedness
* - Tones and Announcement For Unsuccessful Call Attempts and Toll Warnings
- Services Related Operational Guidelines
* - Directory Listings
- Number Portability
- Interim
- Long Term
- National Services
3.0 Interconnection Testing Procedures and Responsibilities
General References: NOF Reference Document Sections 1, 2,3, 4, 6, 7, and 9
and Internetwork Interoperability Test Plan Reference Document
- Responsibility Assignments
- Automatic Testing
* - Pre-Cutover Inter-Network Connectivity Testing
- Interoperability Test Results
*- Process For Circuit Level Testing and Performance Analysis of Unbundled Network Elements
- SS7 and Other Critical Interface Inter-network Compatibility Testing
- Service Protocols/Message Sets
- CCS Interconnection Questionnaires
- SS7 Diversity Verification and Validation
- Information Sharing For Analysis and Problem Identification
- In-depth Root Cause Analysis of Significant Failures
* - Failure Analysis Procedures

Network Interconnection Bilateral Agreement Template (continued)

- Root Cause Analysis Processes
- FCC Outage Reporting Criteria
- Service Configuration
- Protocol Tests
- Compatibility Testing
- Security Testing and Audits
4.0 Network Administration and Management Guidelines, Procedures, and Responsibilities General Reference: NOF Reference Document Section 6, 8, and 9
- Documentation Requirements
- Network Configuration
- Contact Numbers
- Network Administration/Operations Security Management
- Access Methodology
- Functional Partitioning
- Access Control
- Password Control
- Encryption Control
- Calling Party Number Privacy Management
- Security Bas Guideline For Interconnected SS7 Networks
- Network Traffic Management
* - Traffic Engineering Design Criteria and Capacity Management
- Alternate Routing Designs
- Call Blocking Criteria
- Network Rearrangement Management
- Logical
- Physical
- Diversity Requirement Management
- Specific Reference: Committee T1 Report No. 24 on Network Survivability Performance
- Synchronization Design and Company-wide Coordination Contacts
- Specific References: T1.101 Digital Facility Standard, BOC Notes on the LEC Network, and SR-TSY-002275
- Establish Conformance
- Identify Contacts

Network Interconnection Bilateral Agreement Template (Continued)

- Coordination Administration
- Routing and Screening Administration
- Network Call Routing Administration and Management
- Firewall Administration and Management
5.0 Network Transition Considerations
General Reference: NOF Reference Document Sections 6 and 8
- Growth/Consolidation of Network Elements
- NPA Splits/Overlays/Rearrangements
- Major Rehoming, Rearrangement Plans
* - Transition to Use of Emerging or Future Technologies, such as SONET Interconnection,
ODLC, and FTTC
- Vendor Compatibility
- Optional Capabilities
- Feature Interactions
6.0 Billing Considerations
General References: Various documents available through the Ordering and
Billing Forum (OBF)
- Accuracy of Data
- Interval of Records Exchanges
- Dispute resolution
*- Billing Records Data Exchange
- EMR Standards
- OBF Documentation
7.0 Vendor Requirements and Responsibilities
General References: Network Interface Specification Template as well as
pertinent technical standards and documents developed by industry standards forums
- Written Requirements
- Software Validation

Network Interconnection Bilateral Agreement Template

- Optional Requirements
- Testing
- Training
- Emergency Equipment Availability
- Contact Lists
- Interface Specifications For Standard Elements
- Process For Certifying Combination, Intermingling, and Operation of NEs

APPENDIX C

A Sampling of Standards Organizations and Conformity Testing Programs and Facilities

Lists of standards groups can be found at several Websites. The most complete lists include the ISO, NIST, and ANSI.

Intertek Testing Services, NA Inc. (ETL and Warnock Hersey) Paul Moliski 3933 U.S. Route 11 PO Box 2040 Cortland, NY 13045-0950 Tel: 607-753-6711 Fax: 607-756-9891 E-mail:pmoliski@itsqs.com	Program AP # 0204 A - Electrical Products 1. Electrical/Electronic Products 2. Medical Devices 3. Laboratory Equipment 4. Ventilating and Conditioning 5. Equipment for Buildings 6. Hazardous Location Equipment 7. Luminaries 8. Appliances 9. Information Technology/Telecom B - Gas and Oil Products 1. Heating Appliances 2. Cooking Equipment C - Sanitation Products 1. Food Service Equipment 2. Pool and Spa Equipment D - Telecommunications Unlicensed Radio Frequency Devices (A1, A2, A3, A4) Licensed Radio Service Equipment (B1, B2, B3, B4) Telephone Terminal Equipment E - Building Products 1. Fire Resistant Rated Assemblies 2. Prefabricated Construction Materials 3. Classified Roof Coverings 4. Plumbing Products 5. Manufactured Wood Products 6. Pressure Treated Wood Products

MET Laboratories, Inc. Mr. Chris Harvey 914 W. Patapsco Ave. Baltimore, MD 21230-3432 Tel: 410-354-3300 Fax: 410-354-3313 E-mail: CHarvey@MetLabs.com	Program AP # 0529 A. Unlicensed Radio Frequency Devices (A1, A2,. A3, A4) B. Licensed Radio Service Equipment (B1, B2, B3, B4) C. Telephone Terminal Equipment

PCTEST Engineering Laboratory, Inc. Mr. Randy Ortanez 6660-B Dobbin Road Columbia, MD 21045 Tel: 410-290-6652 Fax: 410-290-6654 E-mail: randy@pctestlab.com	Program AP # 0522 A. Unlicensed Radio Frequency Devices (A1, A2, A3, A4) B. Licensed Radio Service Equipment (B1, B2, B3, B4) C. Telephone Terminal Equipment

Timco Engineering, Inc. Sid Sanders 849 NW State Road 45 P.O. Box 370 Newberry, FL 32669 Tel: 352-472-5500 Fax: 352-472-2030 E-mail:sid@timcoengr.com	Program AP # 0517 A. Unlicensed Radio Frequency Devices (A1, A2, A3, A4) B. Licensed Radio Service Equipment (B1, B2, B3, B4) C. Telephone Terminal Equipment

TUV Rheinland of North America, Inc. Timothy Dwyer Product Safety Division 12 Commerce Road Newtown, CT 06470 Tel: 203-426-0888 Fax: 203-270-8883 E-mail: tdwyer@us.tuv.com	Program AP # 0534 A. Unlicensed Radio Frequency Devices (A1, A2, A3, A4) B. Licensed Radio Service Equipment (B1, B2, B3, B4) C. Telephone Terminal Equipment

Underwriters Laboratories, Inc. Jodine Smyth 333 Pfingsten Road Northbrook, IL 60062-2096 Tel: 847-272-8800 x 42418 Fax: 847-559-9795 E-mail:Jodine.e.smyth@us.ul.com Multiple Site Listing	Program AP # 0198 • Automotive Equipment • Burglary Protection Equipment • Fire Protection Equipment • Fire Resistance Construction • Burning Characteristics of Building Materials and Furnishings • Fuel Burning Equipment • Fuel Handling Equipment • Hazardous Location Equipment • Liquids and Materials Classified as Fire Hazard • Mechanical Equipment • Ventilating and Conditioning Equipment for Buildings • Ventilating Equipment for Products of Combustion • Marine Products • Electrical and Electronic Products, Processes, Systems, and Services • Health Care and Health Hazard Technologies • Plumbing, Sewage Handling, and Piping • Products, Water Quality 1. Drinking Water Additives 2. Drinking Water Treatment Units -Health and Aesthetic Effects 3. Drinking Water System Units and Related • Components and Materials • Recreational and Occupational Health and Safety • Personal Protective Clothing • Grading Western Red Cedar Shingles and Shakes • Sanitation Telecommunications A. Unlicensed Radio Frequency Devices (A1, A2, A3, A4) B. Licensed Radio Service Equipment (B1, B2, B3, B4) C. Telephone Terminal Equipment

Underwriters Laboratories, Inc. - Additional Sites/Locations

Underwriters Laboratories, Inc
2600 N.W. Lake Road.
Camas, WA 98607-8542
Tel: 360-817-5605

Underwriters Laboratories, Inc
1655 Scott Blvd.
Santa Clara, CA 98607-8542
Tel: 408 985-2400

Underwriters Laboratories, Inc
12 Laboratory Drive
Research Triangle Park, NC 27709-3995
Tel: 516-271-6200

Underwriters Laboratories, Inc
1285 Walt Whitman Road
Melville, NY 11747-3081
Tel: 516-271-6200

Underwriters Laboratories, Inc.
Corporate Headquarters
333 Pfingsten Road
Northbrooke, IL 60062
Tel: 847-272-8800
Fax:847-509-6214

UL International Services Ltd.
No. 260 Da-Yeh Road 4th Floor
Pei Tou, Taipei, Taiwan 112
Tel: 886-2-2896-7790
Fax: 886-2-2891-7644

UL International Ltd.
Block B, 17/F
Veristrong Industrial Centre
34 Au Pui Wan Street
Fo Tan, Shatin
New Territories, Hong Kong
Tel: 852-2695-9599
Fax: 852-2695-8196

UL International (UK) Ltd.
2 Station View
Guildford, Surrey, GU1 4JY, UK
Tel: 044-1483-302-130
Fax: 044-1483-302-230

UL International Demko A/S
Lyskaer 8, P.O. Box 514
DK-2730, Herlev, Denmark
Tel: 45 44 85 65 65
Fax: 45 44 85 65 00

Selected Key U.S. Telecommunications Standards Related Groups

	Key Areas of Standardiza-tion	Key Tech-nologies & Focus Areas	Sponsor	Address & Website	Contact (US) Phone Fax E-mail
Committee T1-Telecommu-nications Committee T1	Telecom Network Interfaces; Interoperabil-ity	BISDN, SS7, PCS, IN, TMN, SONET, Multimedia; Network Reliability, NII/GII	Alliance for Telecommu-nications Industry Solutions (ATIS)	Suite 500 1200 G St. NW Washington. DC 20005 http://www.t1.org	Harold Daugherty (202) 434-8830 (202) 347-7125 haroldd@atis.org
Telecommuni-cations Industry Association TIA	Telecom Equipment	PBXs, Tele-phones, Cellular, PCS, Fiber Systems, Satellite, Radio Systems	TIA	Suite 300 2500 Wilson Blvd. Arlington, VA 22201 & 1300 Pennsylva-nia Ave, NW, Wash-ington, DC 20004 http://www.tiaonline.org	Dan Bart 703-907-7703 703 907-7727 dbart@tia.eia.org
Society of Cable Telecommu-nications Engineers SCTE	Cable TV Systems, especially physical layer	Cable TV Components cable, connectors, modulation	SCTE	140 Phillips Rd., Exton, PA 19341 http://www.scte.org	Ted Woo (610) 363-6888 (610) 363-5898

ATM Forum ATMF	ATM	User-Network Interface, Data Exchange Interface, BISDN InterCarrier Interfaces, Private Network Node Interface (PNNI)	ATMF	2570 West El Camino Real Suite 304 Mountain View, CA 94040 http://www.atmforum.com	Dawn Herman (415) 949-6713 (415) 949-6705 info@ atmforum.com
Carrier Liaison Committee CLC	Telecom	Network Interconnection/Interoperability, Ordering and Billing, Industry Numbering, and Toll Fraud Prevention	Alliance for Telecommunications Industry Solutions (ATIS)	Suite 500 1200 G St. NW Washington, DC 20005 http://www.atis.org	John Manning (202) 434-8842 (202) 393-5453 jmanning@atis.org
National Committee for Information Technology Standards NCITS	Information Technology	Video, Imaging, Storage Media, Data Protocols	Information Technology Industry Council (ITI)	Suite 200 1250 I (Eye) Street NW Washington, DC 20005 http://www2.ncits.org	(202)737-8888 (202)638-4922
Institute of Electrical and Electronics Engineers IEEE	Electrical and Electronics	Local Area Networks, Software Languages, Test and Measurements	IEEE	445 Hoes Lane Piscataway, NJ 08855 http://www.ieee.org	Judy Gorman (908) 562-3820 (908) 562-1571 j.gorman@ ieee.org
Internet Engineering Task Force IETF	Internet	TCP/IP and its Uses to Transport Information - Telnet, FTP	Center for National Research Initiatives (CNRI)	Reston, VA http://www.ietf.org	Steve Coya (703) 620-8990 (703) 620-9913 scoya@ietf.cnri.reston.va.us

International Telecommu-nications Union Telecommu-nications Sector ITU-T	Telecom	BISDN, SS7, IMT-2000, IN, TMN, SDH, Multi-media, Satellite, Fiber Systems, Radio systems, Broadcast Video	United Nations' ITU	U.S. State Department 2201 C St, NW Washington DC Geneva: ITU-T Place des Nations CH1211 Geneva 20 Switzerland http://www.itu.ch/	U.S. Richard Beaird (202) 647-0197 (202) 647-7407 Geneva: Theo Irmer +41227305851
Network Management Forum NMF	Network Management	Service and Network Management	NMF	1201 Mt. Kemble Ave. Morristown, NJ 07960 http://www.nmf.org	(201) 425-1900 (201) 425-1515
Satellite Broadcasting and Commu-nications Association SBCA	Satellite Communica-tions	Satellite Broadcast Equipment Earth Station Equipment	SBCA	Alexandria, VA http://www.sbca.com	(703) 549-6990
Satellite Industry Association SIA	Satellite Communica-tions	Satellite Earth Station Equipment	SIA	225 Rein-ekers Lane Suite 600 Alexandria, VA 22314 http://www.sia.org	Clay Mowry (703) 549-8697 fax (703) 549-9188